



# NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

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## MBA PROFESSIONAL REPORT

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**Government Imposed Constraints and Forecasting Analysis  
of the M.J. Soffe Corporation**

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**By: Kimberly A. Donahue,  
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**December 2004**

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**GOVERNMENT IMPOSED CONSTRAINTS AND FORECASTING ANALYSIS  
ON THE M.J. SOFFE CORPORATION**

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Submitted in partial fulfillment of the requirements for the degree of

**MASTER OF BUSINESS ADMINISTRATION**

from the

**NAVAL POSTGRADUATE SCHOOL  
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## **ABSTRACT**

The purpose of this project is to evaluate the impact of the federal requirements process on the Military Sales Division of the M.J. Soffe Corporation (Soffe), apparel manufacturer, and to identify areas of influence that Soffe can control to shape the requirements of future military needs. M.J. Soffe is a main government supplier of the U.S. Marine Corps uniform olive drab and brown crew neck undershirts. This is a study that complements M.J. Soffe's effort to understand the Federal Acquisition Regulation (FAR) and requirements process to improve their efficiency for future growth. This project will look at the external environment which influences the military garment industry. Also, an analysis of the requirements generation process will be completed to provide recommended opportunities for M.J. Soffe to shape future apparel requests of the military services. Furthermore, the identification of government constraints has effects on manufacturing and sales planning. This report will also look at the residual implications of this relationship towards forecast error and inventory levels.

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## EXECUTIVE SUMMARY

The U.S. Department of Commerce, Bureau of Industry and Security (BIS) reported to Congress in October 2003, the state of our domestic textile and apparel industries. The highlights of this report revealed the overall health of the domestic apparel industry is shrinking and in poor shape.<sup>1</sup> The report optimistically stated that even though the U.S. is in this dilemma, the industry is still competitive in the global marketplace. It declares: “the United States ranks high among all nations in various measures of competitiveness, such as human capital, infrastructure, access to technology, and access to financial markets.”<sup>2</sup> This research shows that the U.S. is employing more people and has more property, plant, and equipment (PP&E), yet is also under utilizing its production capacity. 80% of the companies surveyed by the BIS that currently supply the military have the capability to double production in six months.<sup>3</sup> It also sidesteps to say the U.S. “lags behind only in productivity-adjusted labor costs, and costs associated with environmental regulation.”<sup>4</sup> So, the U.S. is paying higher labor rates and has higher overhead costs to maintain all the PP&E in an underutilized industry. A clear position that comes from this statement is that there is a consumer incentive to outsource to foreign competitors for lower costs.

This paper examines the government constraints placed on the M.J. Soffe Company which may have ramifications on the broader apparel industry. Federal regulations, laws, military policy, small businesses and large businesses were used to baseline the findings and analysis.

Government constraints also have effects on sales. This relationship has residual effects towards forecasting and production. This report analyses manufacturing forecast

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<sup>1</sup> “The U.S. Textile and Apparel Industries: An Industrial Base Assessment.” Congressional Report 2003. U.S. Department of Commerce. Bureau of Industry and Security. [www.bxa.gov](http://www.bxa.gov). Retrieved on 2 November 2004.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

accuracy and the effect on holding inventory to demonstrate a causal relationship between government forces, sales, and production.

The purpose of this paper is to provide insight on the effects of government imposed constraints on a major supplier of military clothing items, the M.J. Soffe Company. Additionally, the research will uncover the impacts of government policy on domestic manufacturing. This analysis will be broken into two halves. The first section details the impacts of government policy on Soffe, while the second half focuses on methods for Soffe to increase their revenue. Even though these thoughts are analyzed independently, there are significant parallels to business operations which can help managers to minimize the impact of lost sales. The study, in whole, can be used by the Soffe Company to influence military sales, sales forecasting, and inventory control.



## **I. INTRODUCTION**

### **A. OVERVIEW**

The apparel industry is driven by the competition of prices, service, delivery time, quality, flexibility, and brand name recognition.<sup>5</sup> In order to remain competitive, government suppliers need to develop a strategy that takes into account current acquisition policies while maintaining a competitive edge in the apparel industry.

With the changes in government acquisition strategies, more emphasis is being placed on supporting small business concerns. The following research and analysis will assess the impact that these policies have on large businesses in the apparel industry. M.J. Soffe is being excluded from the bidding process for reasons including politics and policy. This may also have broader implications on other companies within this industry. This paper will examine the current requirements generation process and find potential areas that businesses can use to influence government acquisitions.

The impacts of these constraints have reduced the number of government contracts awarded to large businesses. This in turn has resulted in a shift toward finding ways to reduce overhead costs as a way to increase profit margins. One of the ways this can be accomplished is by reducing inventory holding costs. Having forecasting models that more accurately predict market fluctuations can decrease the amount of inventory held safety stock. The study will examine a large apparel manufacturer's forecasting history and sales and compare it to a statistically generated forecasting model. The comparison will then be applied to developing a methodology for reducing inventory.

Managers and government policy makers can use this analysis to balance socio-economic requirements with managing internal business practices to lower the acquisition costs to the government without sacrificing manufacturer's profit.

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<sup>5</sup> "Form 10-K." Delta Apparel, Inc. Securities and Exchange Commission, Washington D.C. 3 July 2004.

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## **II. MISSION STATEMENT ANALYSIS**

### **A. M.J. SOFFE COMPANY BACKGROUND**

The M.J. Soffe Company (Soffe) is a major supporter of the United States Armed Forces with a record of supplying the military with textile products since 1964. Milton James Soffe served as a 1<sup>st</sup> Lieutenant in the Army Quartermaster Corps during World War II while stationed at Fort Bragg, North Carolina. Following his honorable discharge M.J. Soffe immediately became a local citizen of Fayetteville, NC. In 1946 Mr. Soffe began a distribution center from his garage in Fayetteville dealing in foreign and domestic goods such as smoking pipes, imported cutlery items, bicycles and binoculars. He soon expanded his operation into a larger work space and hired his two sons Jim and Dick to handle the shipping assembly. Eventually the operation grew into its own commercial facility and he hired his first operations manager, Anthony Cimaglia. In the early 1960's, Mr. Soffe won a bid to manufacture regulation laundry bags for the U.S. Army. This was the birth of Soffe's manufacturing endeavor into military goods. Soon after the first military contract, the M.J. Soffe Company won subsequent contracts that included Army physical training (PT) shorts and U.S. Air Force screen printed t-shirts.<sup>6</sup>

Soffe is one of the few domestic textile manufactures that operates an entirely vertical manufacturing process. They have the capability to manufacture their products from start to finish independent of external suppliers (with the exception of yarn production). Today, Soffe manufactures activewear apparel which is available through specialty sporting goods stores, department stores, collegiate bookstores, and military channels. Their sales totaled \$99.75M in FY2004. Of their customers, military sales contributed to over 26% of their total revenue in FY2004.<sup>7</sup>

Global expansion and emphasis on cost reduction have incentivized Soffe to expand operations abroad to Costa Rica. Costa Rican operations contribute to less than 25% of their total products. However, none of the U.S. domestic military clothing lines are manufactured overseas.

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<sup>6</sup> Soffe Marketing Publication 2004. October 2004.

<sup>7</sup> M.J. Soffe, Inc. Results of Operations FY2004. 3 July 2004.

The U.S. Department of Commerce, Bureau of Industry and Security (BIS) reported to Congress in October 2003, the “unhealthy” state of our domestic textile and apparel industries, but identified them as still “competitive in the global marketplace.”<sup>8</sup> They declare “the United States ranks high among all nations in various measures of competitiveness, such as human capital, infrastructure, access to technology, and access to financial markets.”<sup>9</sup> Their research shows that the U.S. is employing more people and has more property, plant, and equipment (PP&E) than other countries, but is underutilizing its production capacity. 80% of the companies surveyed by the BIS, that currently supply the military, have the capability to double production in six months.<sup>10</sup> It also says the U.S. “lags behind only in productivity-adjusted labor costs, and costs associated with environmental regulation.”<sup>11</sup> Overall, the U.S. is paying higher labor rates and has higher overheads to maintain the PP&E for its underutilized industry. A prudent business person could recognize the incentive to outsource to foreign competitors to benefit from lower production costs; or merger with similar companies to remain competitive.

In mid-2003, Soffe was purchased by the Delta Apparel Inc. (Delta) headquartered in Georgia. After Soffe’s incorporation into Delta, they have become a publicly traded corporation. For manufacturing and sales purposes, M.J. Soffe maintains itself as a separate entity under the Delta umbrella. Soffe still produces 70% of their products in their North Carolina facility. They employ over 1400 people in the Fayetteville area; as well as operate distribution centers in North Carolina, Georgia, Massachusetts, Missouri, Michigan, and California.<sup>12</sup> They also sustain their tradition and support of 100% American made products and strong military sales.

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<sup>8</sup> “The U.S. Textile and Apparel Industries: An Industrial Base Assessment.” Congressional Report 2003. U.S. Department of Commerce. Bureau of Industry and Security. [www.bxa.gov](http://www.bxa.gov). Retrieved on 2 November 2004.

<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

<sup>11</sup> Ibid.

<sup>12</sup> “Workplace Code of Conduct, and Code of Ethics.” Global Human Rights. M.J. Soffe Publication. 2004.

Prior to the Delta acquisition, Soffe was a privately held family business. Now they are a wholly owned subsidiary of Delta, a publicly traded company. The purchase subjects Soffe to laws and regulations that they were not accustomed to prior to this event. Since the acquisition, Soffe must make it a priority to adjust to these changes. Local politics, competition, domestic outsourcing, and regulations have placed significant challenges on this company. If Soffe cannot adapt to these changes, a worst case scenario would have them being driven out of business. The action would have an impact on the local community. It would result in the loss of jobs, decreased revenue and support of other local business. There would also be a further reduction in the U.S. production base in this struggling industry. Conversely, if M.J. Soffe stays in business and continues to lose revenue, the local economy will still be affected.

The impact of federal socio-economic preferences for small businesses places significant constraints on large businesses working to acquire government contracts. M.J. Soffe was impacted by this in 2002, when they lost their long-time Defense Supply Center Philadelphia (DSCP) contract because of a small business set-aside. Because of the Federal Acquisition Regulations (FAR), the contract was given to two companies that were classified as “small businesses,” Campbellsville Apparel and Jensen Activewear. The contract was a split award where Campbellsville Apparel won 60% while Jensen Activewear won the other 40%. Chapter III will explain in more detail the applicable government constraints that pertain to Soffe.

Providing research and analysis on current government regulations relevant to this industry may help Soffe reinsert themselves into the military supply chain. Also, this study may provide insight to government procuring officers and policy makers and help them to gain a deeper understanding of the damaging affects that some government regulations have on the American industrial base. By analyzing Soffe’s current position, policy, and methodologies, the researches hope to provide a framework that can be used to develop a strategy to minimize the effects of government practices.

## **B. METHODOLOGY**

The approach used to obtain the information used in this project was gathered primarily through a site visit to M.J. Soffe’s headquarters facility in Fayetteville, North

Carolina. Questions were developed and pre-submitted to key personnel to inform them of our intentions prior to arrival. Key personnel included the chief executive officer, president, vice president of operations, vice president of military sales and other executive staff.

The qualitative portion of the site visit included: face to face interviews with the above mentioned personnel, a tour of their facilities and collection of marketing and contracting materials. The interviews provided insight into Soffe's history, culture, processes and policies as well as information on specific departments. The tour of the facilities presented an opportunity to observe the entire manufacturing process from order processing to the shipment of finished goods.

Internet searches were done to collect data regarding federal acquisition policies, small business concerns and defense supply contracting. Textile publications were used to become familiar with recent industry developments. Other apparel manufacturers' websites were also viewed to familiarize the researchers with the competition.

Sales data, inventory history, and production planning documents were gathered from various departments within the company as a part of the quantitative analysis. The information was extracted from two inventory management systems internal to Soffe (MOVEX, PKMS). The data was then transferred into Microsoft Excel<sup>®</sup> for statistical analysis for sales forecasting and inventory control.

Figure 1 is a framework for developing policies for meeting the company's strategy. The analysis done in this paper will concentrate on the steps for pre-strategy formulation. The study will provide a new approach to military sales contracting and forecasting that managers can use to set long term objectives and allocate resources.

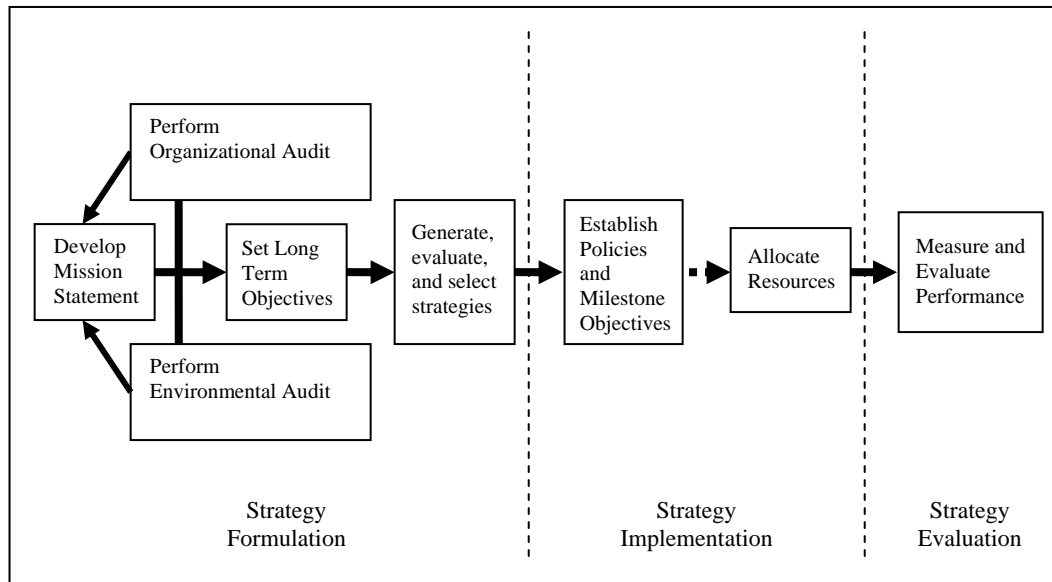


Figure 1. Strategic Management Model<sup>13</sup>

In order to develop the foundation of the analysis, Soffe's core competencies and mission must be identified. A set corporate mission can later be used to develop business strategies throughout the company. Following an assessment of Soffe's mission, information gathered on federal acquisition policy and the requirements generation process can be applied to current company policies to discover areas for contract optimization. Likewise, M.J. Soffe may be able to shape the requirements of military sales by identifying the potential influence points within the requirements generation process.

Once a business strategy is formulated the research will be focused on the components of military requirement generation. Having a thorough comprehension of government regulations, Soffe can make policy decisions that maximize their influence on military sales. Following a military sales analysis, error statistics can be drawn to transform their forecasting process to reflect the variability in changing military demands. Finally, having pinpointed demand forecast inefficiencies, inventory levels can be regulated to maintain high customer service levels while reducing company overhead. As a result, managers can satisfy both government needs and corporate shareholders.

<sup>13</sup> Eaton, Don. Logistic Strategy GB4450. Naval Postgraduate School. November 2004.

### C. INTRODUCTION

Good business leaders create a vision, articulate the vision, passionately own the vision, and relentlessly drive it to completion.

Jack Welch, Chairman, General Electric

This chapter will focus on a method to develop long-term strategies that can be used by M.J. Soffe's managers to build a focused mission that considers Delta's vision and Soffe's values. The research will offer a model for auditing the organization and environmental factors used in preparing a mission statement for Soffe. The process of setting long-term objectives will be left for managers to customize a strategy for their needs. Figure 1 illustrates the model that the researchers used for the analysis. This model exhibits the continuous feedback of auditing and mission development. From these audits, root analysis of core competencies and culture feed into their strategic direction. This information can be used to define a company's mission and help a them focus their strengths towards those goals.

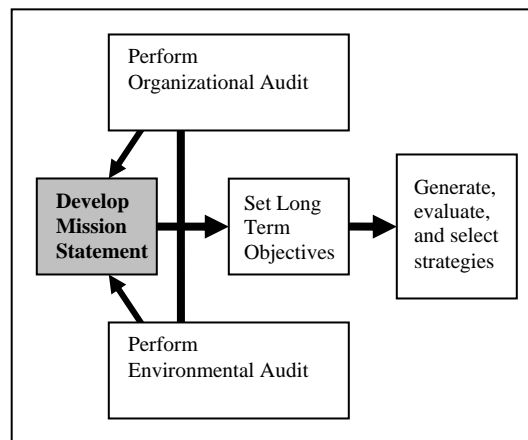


Figure 2. Strategy Formulation: Developing a Mission Statement

### D. DEVELOPING A MISSION STATEMENT

During the site visit to the Fayetteville manufacturing plant, a concrete mission statement for Soffe could not be identified. They do, however, have a general philosophy that has remained the same since the company's inception: *providing the market with*



*products when they need them.*<sup>14</sup> Soffe's parent company, Delta, has a formal, five-part mission statement. Now that Soffe is a part of Delta, they must develop a mission statement that complements Delta's while continuing to reflect their own philosophy and culture. This section will demonstrate how Soffe can tailor a mission to satisfy their needs while emulating government acquisition objectives.

The key foundation of a purpose driven organization is a well communicated vision and mission. "A mission statement should say who your company is, what you do, what you stand for and why you do it."<sup>15</sup> The importance of a mission statement is to provide direction and a common purpose throughout the organization. By not having a mission statement, company departments may follow individual goals that do not maintain the overarching company strategy. Confusion could lead to poor management decisions based on different agendas and non-standard data sources with mismatched interpretations.

An effective mission statement should be communicated, understood and supported by all levels within the company. By giving employees the opportunity to participate in the creation of the mission, a sense of pride will be developed as well as ownership and buy-in into the company's purpose.

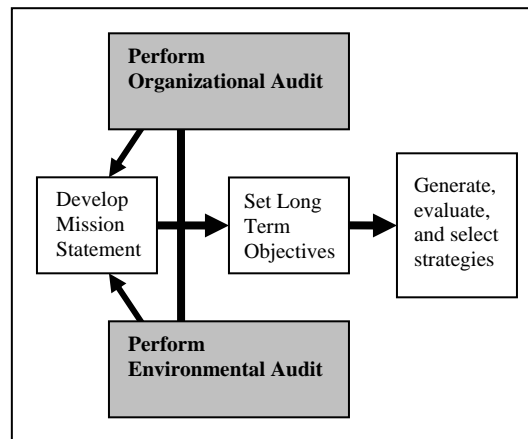


Figure 3. Strategy Formulation External and Environmental Audits

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<sup>14</sup> Soffe Marketing Publication 2004. October 2004.

<sup>15</sup> "Writing a Mission Statement." The Business Planning Experts. [www.bplans.com](http://www.bplans.com). Retrieved on 2 December 2004.

## **E. PERFORMING ORGANIZATIONAL AND ENVIRONMENTAL AUDITS**

This segment will audit Soffe's organizational culture to establish the framework to help Soffe managers tailor a mission statement to set their company's long-term objectives while taking into account Delta. First, Delta's mission statement will be dissected to search for portions that are applicable to Soffe. The relevant sections will be combined with Soffe's principles to provide managers with a preliminary structure for crafting their mission.

Delta's mission statement is comprised of five basic principles as noted on their website. These missions are as follows:

1. Generate a profit to insure continued survival and growth, provide shareholders with a fair return on their investments, and reward employees with job security and improved wages and benefits.
2. Provide customers on a timely basis with quality, competitively-priced products in order to establish and maintain the customer base and customer satisfaction necessary to operate a profitable business.
3. Be a responsible corporate citizen in all respects, including conducting business affairs in a legal and ethical manner.
4. Maintain an employment relationship with all employees based on sensitivity to them as individuals and mutual trust, respect, and working together and provide a workplace and a work environment which is safe, healthy, comfortable, and one which provides personal job satisfaction.
5. Communicate openly and deal fairly and consistently with our customers, shareholders, and employees on all business matters.<sup>16</sup>

## **F. KEY CRITICAL AREAS**

The analysis completed in this section was used to reveal the underlying rationale of Delta's strategy. Once the reasoning behind their mission was identified, the researchers were able to compare them to Soffe's core competencies. This framework provided the depth needed to recommend areas for Soffe to set their goals and mission. Continuing along these lines, the analysis contributed to uncovering potential challenge areas for Soffe to consider for strategy implementation.

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<sup>16</sup> "Frequently Asked Questions." Delta Apparel, Inc. Business Strategy. [www.deltaapparel.com](http://www.deltaapparel.com). Retrieved on 18 November 2004.

Table 1 encompasses Delta's five-part mission to determine a fit to Soffe's traditions. The table was created by the researchers to look for underlying factors that can be used to integrate Delta's strategy into Soffe's mission statement. Delta's principles, listed above, were compared to Soffe's culture to discover areas in which Soffe can adapt without compromising their organizational strengths. In the first column, the five parts of Delta's mission statement are displayed to show "what" is being analyzed. Column two breaks these missions into "how" these missions are to be accomplished. This was done to expose Delta's corporate values to later be measure up to Soffe's values. The third and fourth columns suggest "why" Delta included these principles in their mission. These columns differentiate between internal and external motivators so that a determination can be made on their inclusion in Soffe's mission statement. This process uncovered the basis of Delta's values and will be used to find how Soffe can adapt their goals into formal business objectives.

Soffe's cultural values were assessed in column five to provide a basis for evaluating the potential impacts of Delta's philosophies on Soffe's culture, also shown in column six. The areas of Delta's mission that most relate to Soffe's culture provided a place to begin to develop Soffe's priorities. The last column proposes the degree of difficulty Soffe's may face when transitioning into these missions.

Finally, this information is used to provide a sample mission statement for Soffe. The mission statement provided is a sample based on assumptions that may or may not reflect Soffe's managerial decisions. For a more customized mission statement, it is recommended that Soffe executives consider using this process framework in conjunction with input from all management levels within the company.

Delta's Overall Mission	Delta's Goals	Legally Enforced	Competitively Enforced	Pre-Delta Soffe Culture	Impact on Soffe	Areas for Soffe Goals	Challenge to Soffe
Mission #1 : Insure survival and growth	Profit Generation	---	---	Some emphasis on profit generation	Higher public accountability	Profit and accountability	Yes
	Provide Shareholders Fair ROI	---	---	None prior to Delta	Must develop financial docs	Shareholders ROI	Yes
	Employee Job Security		X	Highly Valued	None, already considered	Employee Satisfaction	No
	Employee Improved Wages		X	Competitive	None, already considered	Competitive Wages	No
	Employee Improved Benefits		X	Competitive	None, already considered	Employee welfare	No
Mission #2: Maintain Customer Base and Customer Satisfaction	Quality Products		X	High Quality	May reduce quality	Continuous quality improvement	Yes
	Timely Products		X	Some Delay	Faster, Leaner	Stable deliverability	Yes
	Competitively Priced		X	Large market share	Reduction in price	Competitive pricing	Yes
Mission #3: Responsible Corporate Citizen	Conduct legal business	X		Yes	More accountability	Legal	No
	Conduct ethical business	---	---	Currently recognized	None	Maintain ethical standards	No
Mission #4: Maintain Employment Relationship	Mutual Trust	---	---	Family atmosphere	None	Continue to current practices	No
	Respect	---	---	Family atmosphere	None	Continue to current practices	No
	Working Together	---	---	Family atmosphere	None	Continue to current practices	No
	Safe Work Env't	X		High Standards	None	Continue to current practices	No
	Healthy Work Env't	X		High Standards	None	Continue to current practices	No
	Comfortable Work Env't	---	---	High Standards	None	Continue to current practices	No
	Job Satisfaction		X	Family atmosphere	None	Continue to current practices	No
Mission #5: Communicate Openly and Deal Fairly	Consistently with customers	---	---	Yes	None	Continue to current practices	No
	Consistently with shareholders	---	---	None	None	None	No
	Consistently with employees	---	---	Yes	None	Continue to current practices	No

Table 1. Delta to Soffe Strategy Comparison

### **1. Delta Mission Statement #1: Insure Survival and Growth**

Current economic trends with outsourcing to foreign companies have emphasized the importance of domestic corporate longevity. This has impacted the apparel industry in part by the tariffs imposed by the North American Free Trade Agreement of 1994 (NAFTA) on agricultural products (yarn) and commodities (oil/polyester). Outsourcing has forced this industry to compete with low-cost foreign suppliers. It is an ongoing struggle for companies in this industry to continue to generate a shareholder profit and provide job security with suitable wages and benefits.

*Should Delta's first mission be incorporated in Soffe's mission statement?*

Yes, Delta's first statement should be included in Soffe's mission. Even though Soffe is a subsidiary of Delta, they are still major players in this industry and their local economy. In order to ensure survival and growth, profit generation is a continuous goal. Now that Soffe is part of a publicly traded entity, there is more visibility placed on them by Delta's shareholders. If Soffe can remain a strong player in this market, they will be able to continue to offer competitive wages and benefits to their employees.

### **2. Delta Mission Statement #2: Maintain Customer Base and Customer Satisfaction**

Customer satisfaction is vital to maintaining Delta's customer base. Providing products that are competitively priced and delivered on-time helps Delta develop long-term relationships with their major buyers. A high quality manufacturer that is also reliable is a substantial competitive advantage.

*Should Delta's second mission be incorporated in Soffe's mission statement?*

Yes, Delta's second statement should be included in Soffe's mission statement. This industry is highly competitive and driven by brand name recognition and reputation. Soffe's high quality products should continue to be a part of their philosophy as well as their mission statement. This was a considerable factor in the founder's vision of the M.J. Soffe Company.

### **3. Delta Mission Statement #3: Responsible Corporate Citizen**

Businesses have legal responsibilities to company stakeholders to uphold the law within their business practices. These are enforced through federal statutes and independent audits (e.g. Sarbanes-Oxley Act of 2002). Ethical obligations are driven by company leadership and internal controls. Upholding high legal and ethical standards are vital to building trustworthy business relationships.

*Should Delta's third mission be incorporated in Soffe's mission statement?*

No, Delta's third statement should not be included in Soffe's mission. These practices are already enforced by legal and moral principles. Furthermore, Soffe has been recognized by North Carolina environmental agencies, state political representatives, and community leaders for implementing exceptional business practices in support of their local economy.

### **4. Delta Mission Statement #4: Maintain Employment Relationship with Employees**

In order to foster healthy employee relations, Delta has made employee welfare as top priority within its organization. This helps reduce workforce turn-over force and absenteeism. Open communication builds a mutual respect at all levels within the company and helps establish a comfortable work environment. Comfortable and safe work environments are a priority that contributes to higher productivity and fewer mishaps.

*Should Delta's fourth mission be incorporated in Soffe's mission statement?*

Yes, Delta's fourth statement should be included in Soffe's mission. Soffe's strong employee culture is highly valued by current and prospective employees. They pride themselves on keeping their "small family" atmosphere even though their company has grown to over 1,400 employees. Soffe will be able to emphasize the importance of employee relationships by highlighting it in their mission statement.

### **5. Delta Mission Statement #5: Communicate Openly and Deal Fairly**

The researchers view this as a summary statement that incorporates all of the points mentioned previous statements. Fair business practices and open communication are the basis for legal and ethical conduct, good customer relations and a desirable work

environment. By incorporating all of these statements into one, Delta is ensuring that their stakeholders are taken into account so that healthy business relationships are maintained.

*Should Delta's fifth mission be incorporated in Soffe's mission statement?*

No, Delta's fifth statement should not be included in Soffe's mission. The components of the statement have already been addressed in previous portions of Soffe's mission. Delta does not follow the mission statement format given in introduction of this section. An effective mission statement is concise in consideration of these factors:

- Who you are
- What you do
- What you stand for
- Why you do it

Soffe should use this template to identify value-added objectives to simplify their goals into a clear and concise mission statement. This would make certain that every one across the organization would understand their roles within the company and provide a framework for strategy development, implementation, and evaluation.

#### **G. SOFFE SAMPLE MISSION STATEMENT FRAMEWORK**

Who you are:

Soffe is a publicly owned large business.

What you do:

Soffe manufactures activewear apparel.

What you stand for:

Soffe stands for family values, high quality merchandise, competitive prices and employee welfare. Soffe believes in supporting the local economy.

Why you do it:

- Family values because of tradition and to build trustworthy business relationships
- High quality merchandise because of experience and reputation

- Competitive prices for increased sales and reputation
- Employee welfare because of family values and reputation

A sample mission statement for M.J. Soffe is:

Be a leading provider of high quality apparel at competitive prices while maintaining desirable employment and support to the local economy.

## **H. CONCLUSIONS**

Soffe's core mission must be understood to provide direction at every level within the organization. By having the entire company revolving around the same goals, the combined efforts of many will create a force multiplier. The mission statement can also be used by analysts to assist in developing new courses of action that generate innovative opportunities to become more efficient. This is especially true when dealing with transitional periods or when companies experience extreme shifts in sales behavior. The following section will examine an occurrence where Soffe's sales rapidly declined. This event will be analyzed to determine an appropriate course of action.



### **III GOVERNMENT IMPOSED CONSTRAINTS ON M.J. SOFFE COMPANY**

#### **A. FEDERAL CONTRACT REVIEW AND ANALYSIS**

The M.J. Soffe Military Sales Division works with two distinct government acquisition funding pools, appropriated and non-appropriated funding (NAF). Appropriated funding is money set-aside by law for a specific public purpose and drawn from the U.S. Treasury (e.g. defense funding). Non-appropriated funding is money that is derived from sources other than Congressional Appropriations and is used to augment appropriated funds (e.g. Morale, Welfare and Recreation funding)<sup>17</sup>. Each type of funding has its own federal guidelines, and these guidelines have an effect on the way the military sales department conducts business.

The Defense Supply Center Philadelphia (DSCP) is the primary supply center for military clothing and textiles items. DSCP identifies tests and approves commercial items for use by the military. Once approved, these items are purchased and distributed to the services. DSCP make use of appropriated funds in accordance with the Federal Acquisition Regulations (FAR).

M.J. Soffe had been providing DSCP with military garments since 1964. However, in 2002, Soffe's military sales went from approximately 45% of their total revenue to 26%.<sup>18</sup> This loss of revenue was a direct result of a DSCP requirement change. DSCP analyzed their requirements and made a decision to set it aside for small businesses under the provisions outlined in FAR Part 19. The new constraint mandated that DSCP make this requirement a small business set-aside due to the increased number of small business contractors capable of responding to solicitations. DSCP published their requirements as a competitive solicitation through the Federal Business Opportunities (FedBizOpps).

Despite DSCP's solicitation indicating small business preferences, Soffe submitted a proposal which was responsive, responsible and offered competitive low

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<sup>17</sup> Budget and Financial Management Guide. Naval Air Systems Command. 27 January 1999.

<sup>18</sup> M.J. Soffe, Inc. Results of Operations FY2004. 3 July 2004.

pricing. Due to restrictions on large businesses, M.J. Soffe was not considered to be in the competitive range by the DSCP contracting officer. The contract was awarded for a five-year period and worth approximately nine million dollars per annum of appropriated funds.<sup>19</sup> Campbellsville Apparel won the majority of the contract (60%) and Jensen Activewear won the remainder (40%), both are small businesses.

The differences between responsive and responsible are described in the FAR. According to FAR Part 9.104-1, a responsible prospective contractor is defined as:

- Having adequate financial resources to perform the contract, or the ability to obtain them,
- Being able to comply with the required or proposed delivery or performance schedule, taking into consideration all existing commercial and governmental business commitments,
- Having a satisfactory performance record,
- Having a satisfactory record of integrity and business ethics,
- Having the necessary organization, experience, accounting and operational controls, and technical skills, or the ability to obtain them,
- Having the necessary production, construction, and technical equipment and facilities, or the ability to obtain them,
- Being otherwise qualified and eligible to receive an award under applicable laws and regulations.

A responsive bidder is defined in the FAR Part 14.301 as a bid that complies in all material respects with the solicitation. Simply stated, a competitive bidder must have the capability and resources to perform the work, and submit a proposal that meets all the requirements stated in the solicitation.

This study aims to identify the influence points a large business can lever to shape government requirements and market directly to the service buyers. Areas that will be examined include: understanding and capitalizing on the framework set forth in the Federal Acquisition Regulation, illustrating how M.J. Soffe fits within the federal framework, identifying the political control points within the acquisition process, and indicating opportunities to influence Department of Defense (DoD) procurements.

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<sup>19</sup> “Campbellsville Apparel Wins Military T-Shirt Contract.” Textile World. August 2002. [www.textileworld.com](http://www.textileworld.com). Retrieved on 1 November 2004.

Soffe's past business practices and socio-economic support will also be analyzed since they are considerable factors in the health of the national industrial base and their local economy.

## **B. REQUIREMENTS AND CONTRACTING METHODOLOGY**

The analysis is based on qualitative data that was collected during focused contact interviews with key personnel within the M.J. Soffe manufacturing plant, phone calls with contracting officials at DSCP, and contacts with personnel administrators at FedBizOpps. Literature reviews were also performed of the FAR, M.J. Soffe internal publications, accounting documents, and on-line research of the apparel industry.

This data will also be used to illustrate the requirements process and identify the influence points from Soffe's perspective. Key players will be highlighted in this chain of events. The resulting data and analysis can be used to formulate internal proactive strategies in order to be more competitive in the acquisition environment. Finally, an overview will be provided of the political climate and external environment that M.J. Soffe must work within.

## **C. DEFENSE ACQUISITION AND REGULATION**

The complexity of the acquisition environment involves four major sectors. Figure 4 shows the placement of Soffe in the defense requirements environment. This chart will also highlight potential areas of influence.

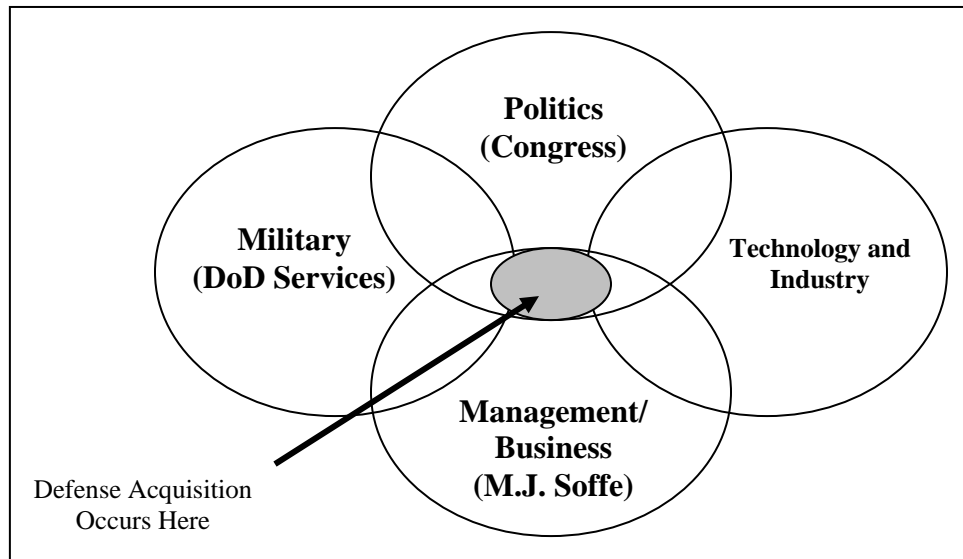


Figure 4. Defense Acquisition Influences<sup>20</sup>

Although Soffe is not a small business, they pride themselves in the support they provide to small businesses. In fiscal year 2004, Soffe contributed approximately \$32 million in support of small business concerns.<sup>21</sup> Soffe employs over 450 companies that fall into the small business, small disadvantaged business, or women owned businesses categories. Some of these companies include: marketing firms, print shops, information technology (IT) support, building supplies, automotive services, as well as many other suppliers.

Soffe's position within the defense procurement process was identified by using Carroll Publishing's Defense Organizational Charts (2001). Attachment A, Department of Defense Acquisition and Organization Chart, illustrates the specific areas within the DoD framework that applies to the requirements generation of the items that M.J. Soffe manufactures for the military services. The Marine Corps was used to illustrate how Soffe interacts with the government acquisition system. With the exception of direct Marine Corps contact, this model can be used with other services.

<sup>20</sup> Boudreau, Michael. Principles of Acquisition Course MN3331. Naval Postgraduate School. November 2004.

<sup>21</sup> Small Business Dealings. Vendors List. M.J. Soffe. 2004.

There are also government constraints that segregate businesses that manufacture American made products from those who subcontract responsibilities to other countries. These constraints are the Berry Amendment and the Buy American Act. Soffe complies with both of these regulations by upholding a strict policy of constructing their entire military clothing line within the United States. The yarn used for these items is supplied by domestic providers. From this point, Soffe vertically manufactures their military clothing line by weaving, dyeing, cutting, and sewing the fabric into a finished item within its own facilities.

The Berry Amendment states that funds made available to the DoD may not be used to purchase clothing or other textile items unless it is grown, reprocessed, reused, or produced in the United States.<sup>22</sup> “In other words, covered end items, components, and materials purchased with funds made available to the DoD must be produced wholly in the United States.”<sup>23</sup> The Berry Amendment is enforced through the Defense Federal Acquisition Regulation Supplement (DFARS) Subpart 225.7002.

The Buy American Act (41 U.S.C. 10a) establishes a preference for purchases of domestic end products valued in excess of the micro-purchase threshold for use (\$2,500) within the United States. Under this act, an item is considered “American” if the costs of its American made components make up more than 50% of the final cost. The Buy American Act applies to all federal agencies as implemented through the FAR Subpart 25.1 and for the DoD, in DFARS Subpart 225.1.<sup>24</sup>

As explained in detail by the FAR and DFARS, the Berry Amendment and Buy American Act are separate and distinct domestic preference requirements.<sup>25</sup> Although they both support American made product manufacturers, the Berry Amendment focuses more on the textile industry. A recommendation to Soffe would be to emphasize their compliance with these statutes to encourage government visibility and political support.

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<sup>22</sup> Bureau of Industry and Security website, November 10, 2004 Article Department of Defense Enforcement of Berry Amendment and Other Buy American Restrictions.

<sup>23</sup> Ibid.

<sup>24</sup> Ibid.

<sup>25</sup> Ibid.

#### **D. SMALL BUSINESS SET-ASIDES**

Since the change of DSCP's requirement to a small business set-aside caused Soffe to be excluded from the competitive range of bidders, it is valuable to investigate the policies behind this change. A phone conversation with the program manager for clothing and textiles at DSCP revealed the reasons behind the requirements change. FAR Part 19 was cited as the justification, but the research uncovered that the FAR did not change. The growth in the number of small businesses competing for this contract rose to a level that fell within a range of small business set-asides outlined in the FAR to cause the government to mandate an award to a small business. Also, the Small Business Act is a tool used for defining the requirements of small businesses.

Furthermore, there are federal changes and emphasis on competition that have created a shift where DSCP awards their contracts to help the government meet small business requirements. There are several programs available to small businesses such as the Certificate of Competency, the Non-Manufacturer Rule Waiver, the Size Determination programs, the Woman's Procurement program, the Veteran's Procurement program, the Procurement Awards program, and the Annual Joint Industry/SBA Procurement Conference. There are also federal procurement policies directed towards small business set-asides.

The Small Business Act defines a small business concern as: "one that is independently owned and operated and which is not dominant in its field of operation."<sup>26</sup> The Small Business Act also reveals what constitutes a small business, such as the maximum number of employees that a business can have under this classification and still be considered a small business is 500 for an apparel manufacturer.<sup>27</sup> This definition will vary from industry to industry to reflect industry differences accurately.<sup>28</sup> The Soffe Company is classified as an apparel manufacturer under this guidance (Subsection 315)

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<sup>26</sup> "What is a Small Business." Small Business Administration. [www.sba.gov](http://www.sba.gov). Retrieved on 11 November 2004.

<sup>27</sup> "Small Business Size Standards." Small Business Administration. [www.sba.gov](http://www.sba.gov). Retrieved on 11 November 2004.

<sup>28</sup> Ibid.

and the North American Industry Classification System (NAICS).<sup>29</sup> Therefore, within these guidelines, with over 1400 employees Softe is not considered a small business.

The purpose of a small business set-aside is to award certain acquisitions exclusively to small business concerns to provide the maximum practicable opportunities to these businesses. FAR Part 19 states: “Small business concerns shall be afforded an equitable opportunity to compete for all contracts that they can perform to the extent consistent with the government interest.”<sup>30</sup> The Department of Commerce determines on an annual basis the percentage of contracts that will be reserved for small businesses. The government’s goal is to allocate 23% of its annual expenditures to small businesses according to the Small Business Administration (SBA). For FY2003, this number includes 5% to woman-owned small businesses, 3% to service disabled veterans, and 5% to small disadvantaged businesses; and a HUB Zone goal of 3%. The DoD is required under the FAR to comply with these percentages. In addition, every acquisition that is anticipated to cost between \$2,500 and \$100,000 (a.k.a. simplified acquisition threshold) is automatically reserved for small businesses as stated in FAR Part 19.

#### **FAR Part 19-502.2 (a)**

(a) Except for those acquisitions set-aside for very small business concerns (see subpart 19.9) each acquisition of supplies or services that has an anticipated dollar value exceeding \$2,500 (\$15,000 for acquisitions as described in 19.201(g)(1)), but not over \$100,000, (\$250,000 for acquisitions described in paragraph (1) of the Simplified Acquisition Threshold definition at 19.201), is automatically reserved exclusively for small business concerns and shall be set-aside for small business unless the contracting officer determines there is not a reasonable expectation of obtaining offers from two or more responsible small business concerns that are competitive in terms of market prices, quality, and delivery.

Federal regulations also allow for small businesses to obtain waivers to compete against larger corporations, assuming the government contracting officer is led to believe

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<sup>29</sup> “Small Business Size Standards.” Small Business Administration. [www.sba.gov](http://www.sba.gov). Retrieved on 11 November 2004.

<sup>30</sup> “Small Business Programs.” Federal Acquisition Regulation Part 19.201 4 November 2004. Contracting Laboratory Far Site. <http://farsite.hill.af.mil>. Retrieved on 15 November 2004.

two or more small businesses will bid on the solicitation. FAR Part 19-502.2(c) notes a likely scenario of why Softe was not considered for this contract.

#### **FAR Part 19-502.2 (c)**

(c) Waivers permit small businesses to provide any firm's product. The exception permits small businesses to provide any domestic firm's product. In both of these cases, the contracting officer's determination in paragraph (b)(1) of this subsection or the decision not to set-aside a procurement reserved for small business under paragraph (a) of this subsection will be based on the expectation of receiving offers from at least two responsible small businesses, including non-manufacturers, offering the products of different concerns.

#### **FAR Part 19-502.2 (b)**

(b) The contracting officer shall set-aside any acquisition over \$100,000 for small business participation when there is a reasonable expectation that

(1) offers will be obtained from at least two responsible small business concerns offering the products of different small business concerns (but see paragraph (c) of this subsection);

### **E. SOCIO-ECONOMIC IMPACTS**

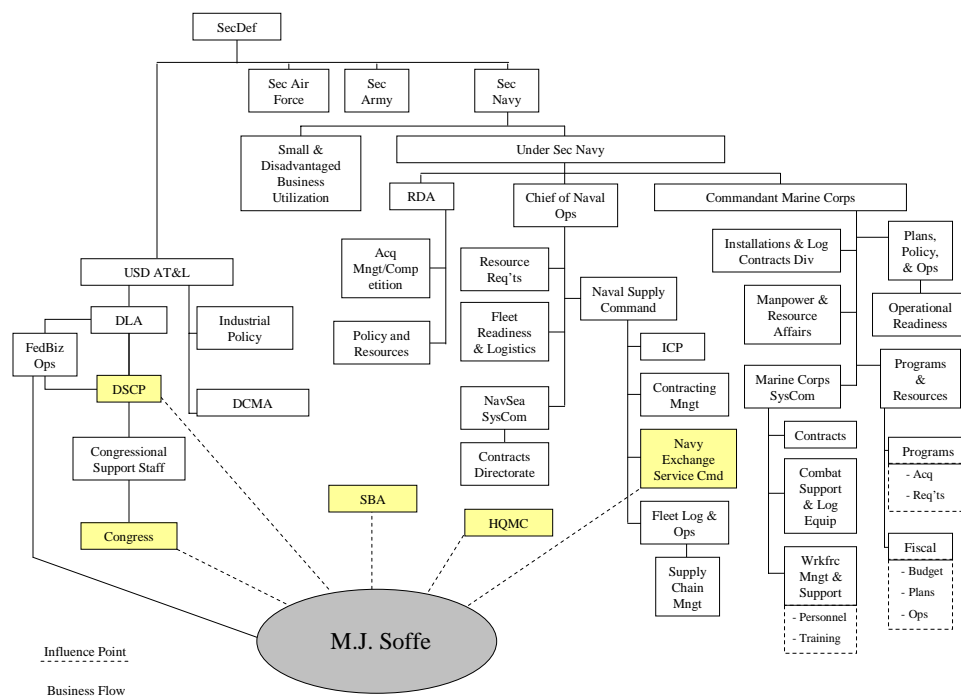
M.J. Softe may not be classified as a small business but they have much to offer to their local economy. In fact, their footprint to local businesses is relatively large for their district. Softe provided approximately \$32 million in revenue to over 450 small businesses in FY 2004. Softe is supporting various service and product providers in local and surrounding communities. These providers include small businesses, small disadvantaged businesses, and women owned businesses. The forgone revenue since 2002 from the loss of the DSCP contract has had undocumented residual effects on the local economy. For instance, Softe's support to the local community and socio-economic programs has decreased employment opportunities and revenue.

### **F. INFLUENCE POINTS**

There are contact points in the external environment of the requirements system that Softe could influence to affect future solicitations. These points include Congress, military service representatives, the SBA, and DSCP (see Fig 5, Points of Softe



Influence). A strategic alignment of focal points can give Soffe an edge to shape the requirements of military apparel sales.



## 1. Congressional

Soffe can influence small business decisions by having a voice in the House of Representatives, specifically the Committee on Small Businesses. This committee has been concerned with the loss of manufacturing jobs since 2002, and they are holding hearings to evaluate the causes.<sup>31</sup> This committee is supported by Congressional districts 1 and 13 of North Carolina. Soffe could use their leverage (employment and local revenue) to influence the policies discussed here. Unfortunately, Soffe does not have representation on this committee by their seventh district Congressman, Mike McIntyre. There is, coincidentally, one vacancy on this committee that Soffe could exploit at the time of this report.

## **2. Market Niche**

Soffe could establish a niche by marketing their products directly to the military service representatives and users. This will give Soffe an inside track to influence and shape the future of military requirements around their innovations, and promote the “Soffe” brand name. Soffe can solicit new innovations to create requirements that the military is unaware of, and build brand name recognition so the service could request Soffe products.

DSCP is also an influence point because they are the testing agency for new textile products within the military. This would be another avenue for Soffe to explore to market their new product lines. Soffe can maintain communications with DSCP to introduce new products, stay abreast of federal guidelines and regulations, and receive “word of mouth” information of impending solicitations. By maintaining a close relationship with DSCP, opportunities may also present themselves for Soffe to submit unsolicited proposals.

Soffe can increase their contracting opportunities by cultivating more requirements from a broader array of government agencies. Other federal sources of potential revenue are: Federal Bureau of Investigation (FBI), National Guard, Reserve Office Training Corps (ROTC) detachments, and law enforcement and fire departments. Increased visibility in these areas will promote greater prospects for sales generation.

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<sup>31</sup> “Oversight Committee Plan on Small Business.” House of Representatives Committee on Small Business. [www.house.gov/smbiz/](http://www.house.gov/smbiz/). Retrieved on 1 November 2004.

Lastly, Soffe could make a case to change the requirement to a partial set-aside. FAR Part 19.502-3 clarifies the procedure behind this action. The contracting officer has the authority to make use of this option. The conditions under which this clause may be enacted are:

- When a total set-aside is not appropriate,
- The requirement is severable into two or more economic production runs or reasonable lots,
- The acquisition is not subject to simplified acquisition procedures.

Note that, a partial set-aside shall not be made when there is a reasonable expectation that only two business concerns (one large and one small) with capability will respond with offers.

### **3. Organizational Restructure**

To be competitive in a small business environment Soffe must restructure the way they compete for these requirements. Given the backdrop of using small business set-asides, Soffe should re-enter this market by establishing a separate entity of military sales. This could be done by breaking off their military sales division from their parent company and re-establishing themselves as a small business entity. This satellite division would be in existence to solely compete for DSCP contracts and other government appropriated funding requirements.

This could be done by separating the military department by “paper” only, whereas they would remain geographically located within the Soffe plant. This small detachment would have to maintain its own managerial control with no organizational links to Soffe or Delta in order to claim small business status. The Military Department could lease the space, equipment, and resources under activity-based principles. The benefits to this include:

- Ability to track their own profitability,
- Determine whether efforts towards military focus is providing maximum return on investment,
- Allows them to use the leverage of Soffe’s marketing, distribution, warehouses, and supply chain,

- Keeps military goals focused on government requirements so that they are not diluted by the strategy of commercial sales.

Soffe does not maintain a dedicated marketing department. The lack of an expert team of marketers limits the ability for Soffe to expand and adapt to the changes from a smaller, family owned business to a large, publicly traded corporation. A marketing department will have expert marketers, sales representatives, and sales forecasters that contribute directly to planning, production, and sales. This team of experts will promote contract opportunities by increasing the visibility of Soffe's name, performing statistical analyses of forecasting, and exploiting new markets. Soffe cannot expect to achieve growth and customer satisfaction by using "multi-taskers" to market, sell, and forecast as they are currently doing.

## **G. ANALYSIS AND FINDINGS**

The analysis found from this research shows that prices were not a consideration in regard to Soffe's exclusion in the awarding of the DSCP contracts. FAR Part 19 explains in detail why these DSCP contracts are being awarded exclusively to small businesses. These contracts are being awarded to small businesses because of the large number of small business that are competing in this market. Also, according the FAR Part 19 for acquisitions above \$100,000, contracting officers are required to make a "best effort" attempt to make use of small, disadvantaged, and woman-owned small businesses. Finally, as long as there are two or more responsible offerors with reasonable proposals who are classified as small businesses, the contracting officer must make the solicitation a small business set-aside. In fact, the program manager for clothing and textiles at DSCP stated that there are "so many" small business competitors in this market that they are in direct price competition with each other.

Research uncovered that the military undershirt contracts with DSCP are exclusively small business set-asides for three main reasons:

- The growth of small businesses capable of bidding for this contract exceeded the amount required for a small business set-aside.
- The government contracting official may have expected two or more small businesses to be responsive to the solicitation (which opened the opportunity for waivers).

- The small businesses may have submitted waivers allowing them to block larger businesses from competing.

## **H. RECOMMENDATIONS**

The importance of strategy development from the top-down is paramount in creating an organization that is aligned and focused on the same goals. The mission statement given in Chapter II is a model for Soffe to follow in order to tailor their direction in lieu of the merger with Delta. The first recommendation is to form an overarching mission statement to ensure all the divisions within Soffe are combining their efforts and resources towards common objectives.

Being in military sales, Soffe can use the leverage of the Berry Amendment to boast their prominent history of 100% American made products. This long-time tradition of Soffe should not be over-looked as a strong selling point to government agencies. This can be emphasized with their support to the DoD and with their production quality. Likewise, they can be highly effective by marketing through military exchange services' advertising circulars.

Although Soffe cannot currently compete for DSCP contracts, there are many influence points along the textile and clothing acquisition process for them to exploit. Soffe needs to take a proactive role in the process and assert themselves and their product to affect policy and shape the requirements of military goods.

If Soffe attacks the market from multiple points of entry, it will increase their chance of creating new requirements for the military and affecting policy decisions. By cultivating more requirements from a broader array of government agencies will open more opportunities for acquiring funding from appropriated sources. However, if all avenues are exhausted and no progress is made, then the researchers propose that Soffe considers the possibility of exiting the market of military appropriated funding and focus more heavily on expanding operations in their non-appropriated accounts.

Soffe should create a marketing department to alleviate the collateral duties of their military sales managers. A dedicated marketing section will consolidate the uncoordinated, individual efforts of the many independent departments.

Finally, the concept of separating the military sales department is suggested to take advantage of the changes in federal procurement policy and to exploit small business set-asides. If Softe wants to compete in the arena of small businesses, this approach is highly recommended. If this action is implemented, the corporate leaders at Softe and Delta should implement this transition prior to year 2006. Since the DSCP contract was awarded for five years starting in 2002, the contract will be re-competed sometime in 2006, for award in 2007.

## **IV. ADAPTING TO GOVERNMENT CONSTRAINTS THROUGH OPERATIONAL POLICY**

The first half of this project detailed the impacts of government policy on Soffe. Federal policy has direct effects on the way Soffe manages their contracts. The second half will concentrate on business operations that relate to contract policy. Business managers can exploit the parallels between contract policy and business operations to minimize the impact of lost revenue. Although these activities are different from a functional standpoint, their relationship is critical to the overall strategy of the company. Contract policies and business operations are inseparable to business planning and if separated would cause a mismatch of the company's overarching strategy to their capability to meet that strategy. As such, the remainder of this report will focus on statistical methods that Soffe can use to increase their profitability by reducing their overhead costs.

### **A. OPERATIONS INTRODUCTION**

DSCP contracting determines the amount of goods to produce and to deliver during a period of time. In light of the 2002 DSCP contract closure, M.J. Soffe lost its predictable sales demand and therefore a stable production schedule. Since this occurrence, Soffe has become more engaged in demand forecasting with their military exchange accounts. These accounts include the Navy Exchange Service and the Army Air Force Exchange Service. This section will identify the impact of forecasting anomalies on their M280/3-309 undershirt used by the U.S. Marine Corps. The M280 stands for the military style 280 production model t-shirt. The "/3" explains that there are three shirts per package. Finally, 309 is the color designator for olive drab (OD) green. Although this study focuses on one production item, the analysis performed in the following chapters can be applied to their other product lines.

During the site visit, it was identified that there were questionable disconnects with marketing, sales forecasting, production planning, and inventory. It was also noted that Soffe has no formal marketing department for their military items. Their current methodology for forecasting inventory stock levels is performed by their sales managers.

Soffe maintains a Manufacturing Requirements Plan (MRP) which takes into consideration their current inventory level, their sales forecast, and reserved orders. This plan implies that their “batch” processing system anticipates their requirements and holds inventory until it is purchased. This approach adds to the lead-time required to meet customer orders and increases inventory on-hand. Since large batches must be scheduled well in advance, it also encourages the practice of requesting “expedited” orders toward the end of the cycle, if demand is unexpectedly strong. Expedited orders in turn push the lead-time further back for other non-rushed customer orders.

Soffe maintains two inventory management systems (MOVEX and PKMS). The MOVEX system tracks inventory as work in progress from griegie goods to a finished product. Griegie goods are bolts of fabric that have not been processed through the dying facility. The griegie goods then become work in progress (WIP) after the fabric has been dyed and cut. From this point on, the work in progress materials are scanned into the MOVEX database at every entry and exit point along the manufacturing line. Figure 6 provides a cursory view of the manufacturing process of the M280 undershirt.

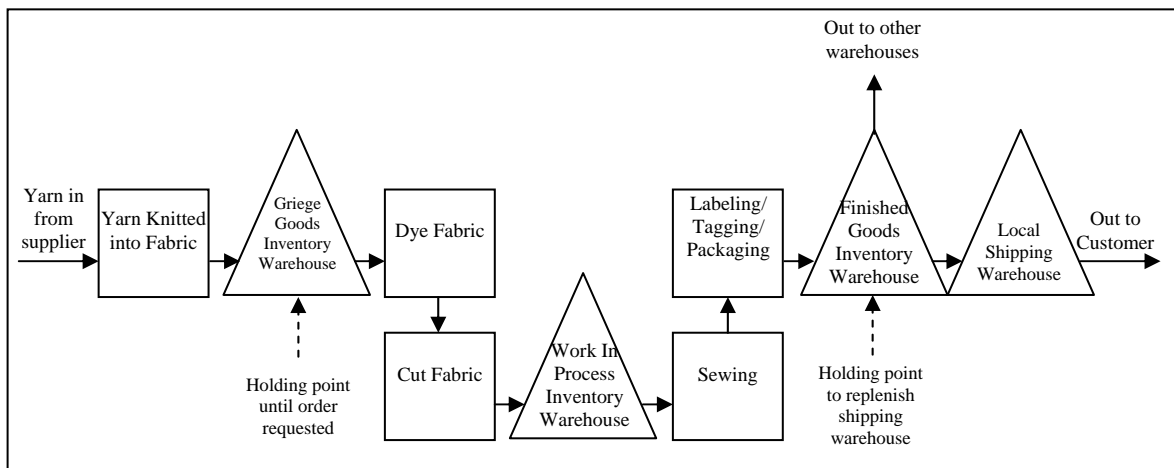


Figure 6. Soffe Production Flow

After sewing and tagging the finished apparel, they are entered into the MOVEX system which feeds the PKMS system used for warehousing and distribution. This process is complicated and is vulnerable to data loss and inventory mismanagement.



The study begins with forecasting demands based on the sales manager's estimates. This methodology was chosen because demand forecasting drives production planning and has residual effects on inventory. Therefore, Chapter IV (D) will look specifically at Soffe's current forecasting process by using their predicted sales and actual sales. The following chapter will provide a sample forecast methodology to show the benefits of a systematic forecasting process. This chapter will also discuss inventory levels and safety stock. Finally, the research will provide recommendations and suggest opportunities for additional study.

## **B. METHODOLOGY**

The analysis begins with an evaluation of Soffe's forecast to demand for a 13-month period beginning in September 2003, and continuing through September 2004. The data used for this study was collected from Soffe's MOVEX inventory management system. The results of the demand and forecast analysis will be used as a metric to statistically evaluate the variance in their forecasting process. The objective of our analysis is to determine if Soffe's current system of forecasting is efficient for operational planning. Chapter IV (D) will look specifically at the variance of predicted sales and actual sales. The Mean Forecast Error (MFE) is used to isolate the biases present in their history of forecasts. Control charts are used to illustrate the trend of the forecasts and error over time. The control charts are also used to determine the stability of Soffe's forecasting process.

Since uncertain demand and inaccurate forecasts make production and inventory control very difficult, IV (F) uses the results of Chapter IV (E) to analyze inventory levels and safety stock. In order to determine inventory levels that optimally balance costs and the benefit of carrying safety stock to buffer against forecast error and demand variability, the analysis will employ a (Q,R) model<sup>32</sup>. The end result of the study will propose a level of safety stock that is most efficient for minimizing holding costs while maintaining a balanced production line. The calculation of a reorder point can be used to replenish warehouse inventory while maintaining high customer service levels.

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<sup>32</sup> Nahmias, Steven. *Production and Operations Analysis*. 3<sup>rd</sup> ed. McGraw-Hill/Irwin. Boston Massachusetts. 1997.

Customer service levels are defined as the percent of time that an inventory cycle ends (a new batch arrives) without running out of stock. Statistical models are used to determine optimal reorder points from the perspective of replenishing warehouse stock. The reorder point is based on current inventory levels, the forecast methods discussed in Chapter IV (E), and production lead times.

Our goal is to suggest ways to improve forecast process control and inventory safety stock levels. These areas of focus have direct impacts on Soffe's profit margins. By improving forecast accuracy and inventory safety stock levels, Soffe can mitigate some of the problems caused by rush orders, long lead times, and inefficient stock levels. In conclusion, the analysis will provide opportunities to enhance operations, increase customer service rates, and reduce inventory holding costs.

### **C. FORECAST ERROR ANALYSIS**

Understanding forecast variation is critical to efficient operations. Managers at Soffe directly acknowledged a discrepancy between their demand forecasting and production planning. However, the magnitude and impact of their sales forecast error was unclear. The first portion of this section will examine Soffe's current forecast, while the second portion will provide a sample systematic way to forecast.

### **D. M.J. SOFFE'S CURRENT FORECASTING AND PROCESS**

Figure 7 illustrates Soffe's actual sales (demand) of the M280/3 (/3 meaning "3-pack" of items) size small compared to what was forecasted during a 13-month span from September 2003 thru September 2004. Figure 7 and Table 2 demonstrate that Soffe's current forecasting system for the size small SKU is inaccurate by an average of 65%. In every monthly observation for size small, Soffe's forecast was significantly less than their demand. These exhibits show that there may be a considerable shortage of small M280 (309) shirts in their inventory if they do not adjust their forecast upwards to reflect current demand. Fill rate and stock-out will be discussed later. By demonstrating the magnitude of error in Soffe's forecast the researchers have a foundation to base the following analysis.

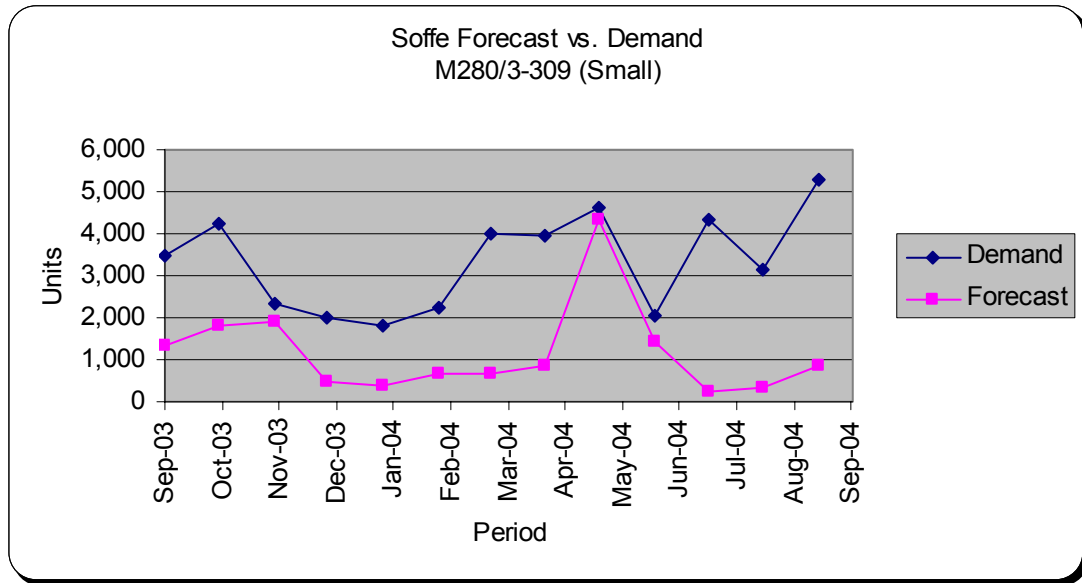


Figure 7. Soffe's Forecast versus Demand

Period	Demand	Forecast	Error	Amount of Error Percentage
Sep-03	3,485	1354	2,131	61.15%
Oct-03	4,244	1787	2,457	57.89%
Nov-03	2,352	1928	424	18.03%
Dec-03	2,005	483	1,522	75.91%
Jan-04	1,796	394	1,402	78.06%
Feb-04	2,222	668	1,554	69.94%
Mar-04	3,983	681	3,302	82.90%
Apr-04	3,951	876	3,075	77.83%
May-04	4,607	4355	252	5.47%
Jun-04	2,029	1420	609	30.01%
Jul-04	4,332	256	4,076	94.09%
Aug-04	3,149	333	2,816	89.43%
Sep-04	5,300	880	4,420	83.40%
<b>TOTAL</b>	<b>43,455</b>	<b>15,415</b>	<b>28,040</b>	<b>64.53%</b>

Table 2. Soffe's Ratio Forecast to Demand

Having shown the existence of an error in Soffe's forecast, the researchers propose to use three primary statistics for accuracy and inventory measurements, the Mean Forecast Error (MFE), Mean Absolute Demand (MAD), and the Root Means Squared Error (RMSE). The MFE and MAD were used to quantify forecast accuracy and the RMSE was used to determine inventory and safety stock.

The MFE was used to determine bias in Soffe's forecasting. If the forecast error is positive then the demand is under-estimated. On the other hand, if the MFE is negative the demand forecast was over-estimated. An unbiased forecast has errors that fluctuate randomly above and below zero<sup>33</sup>. The Mean Forecast Error is the sum of the errors divided by the total errors, stated where MFE  $D_i$  as the actual demand at time  $i$ , and  $F_i$  is the forecasted demand at time  $i$ .

$$MFE = \sum (D_i - F_i) / n$$

The study was performed independently for each size of M280 undershirt for a 13-month period. Table 3 shows the mean forecast error of a small undershirt.

Period	Demand	Forecast	Error	Absolute Error
Sep-03	3,485	1354	2,131	2131
Oct-03	4,244	1787	2,457	2457
Nov-03	2,352	1928	424	424
Dec-03	2,005	483	1,522	1522
Jan-04	1,796	394	1,402	1402
Feb-04	2,222	668	1,554	1554
Mar-04	3,983	681	3,302	3302
Apr-04	3,951	876	3,075	3075
May-04	4,607	4355	252	252
Jun-04	2,029	1420	609	609
Jul-04	4,332	256	4,076	4076
Aug-04	3,149	333	2,816	2816
Sep-04	5,300	880	4,420	4420
<b>MFE</b>				<b>2,156.92</b>
<b>MAD</b>				<b>2156.92</b>

Table 3. Soffe's Error Analysis M280/3 309

In every case for all M280/3 Olive Drab SKUs, the mean forecast errors for Soffe's methodology were positively biased. Consistent under-forecasting can lead to inventory deficits. Inventory deficits can lead to low customer service levels. Planners

<sup>33</sup> Darnell, Andrew, et al. "Supply Chain Analysis of Gabilan Manufacturing, Inc." MBA Professional Report, Naval Postgraduate School. December 2003.

could use these results to control production and inventory levels for safety stock and warehousing management.

The Mean Absolute Deviation (MAD) indicates the mean absolute error of the forecast and can be used here because of the large quantities allowed for variance. The absolute nature of this expression does not exhibit positive or negative bias.<sup>34</sup>

$$MAD = \frac{\sum_{i=1}^n |y_t - F_t|}{n}$$

where:  $y_t$  is the actual demand at time  $t$

$F_t$  is the demand forecast at time  $t$

$n$  is the number of time periods.

Statistical process control charts were used to trace the tendency of Soffe's forecast errors and to attempt to gain insight on the forecasting process. Process control charts allow managers to determine if the forecast is "under-control" (i.e., if the relationship between demand and the forecast model of demand is stable) by looking at the error trends over a period of time.

Figure 8 displays a 3-Sigma control chart (three standard deviations) that Soffe could implement to track their forecasting process. The researchers applied the *Western Electric Zone Tests* to determine whether or not the forecast process is under control.<sup>35</sup> As an example, Figure 8 is populated by data from Soffe's current forecasting process. As demonstrated by the figure, Soffe's current forecasting process lacks control for many reasons as stated by the detection rules of the *Western Electric Zone Tests*.

**Detection Rule #1:** A single point falls outside the 3-Sigma control limits

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<sup>34</sup> Darnell, Andrew, et al. "Supply Chain Analysis of Gabilan Manufacturing, Inc." MBA Professional Report, Naval Postgraduate School. December 2003.

<sup>35</sup> Boudreau, Michael, Acquisition Production and Quality Management MN3384. Naval Postgraduate School. November 2004.

**Detection Rule #2:** At least two of three successive values fall on the same side of, and more than 2-Sigma away from the central line.

**Detection Rule #3:** At least four out of five values fall on the same side of, and more than 1-Sigma the central line.

**Detection Rule #4:** At least eight successive values fall on the same side of the central line.

Detection rules #1, #2, and #3 apply to Soffe's forecasting process. Samples 3, 9, 10, 11, and 13 fall beyond the 3-Sigma threshold. Samples 7 through 13 show that two of any three consecutive points beyond 2-Sigma; and four of five points from values 3 through 13 are outside the range of 1-Sigma. These three detection rules indicate early warning signs of a structural demand change and suggest that Soffe's forecasting process is highly variable and uncontrolled.

There is also a continuous alternation of points above and below the center. This "indicates that there could be two systematically causes producing different results."<sup>36</sup> For example, there could be two different people performing the forecasts at different times, or there may be more than one data source or alternate combinations used to perform the forecast.

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<sup>36</sup> StatSoft Inc. Quality Control Charts. [www.statsoft.com/textbook](http://www.statsoft.com/textbook). 15 November 2004.

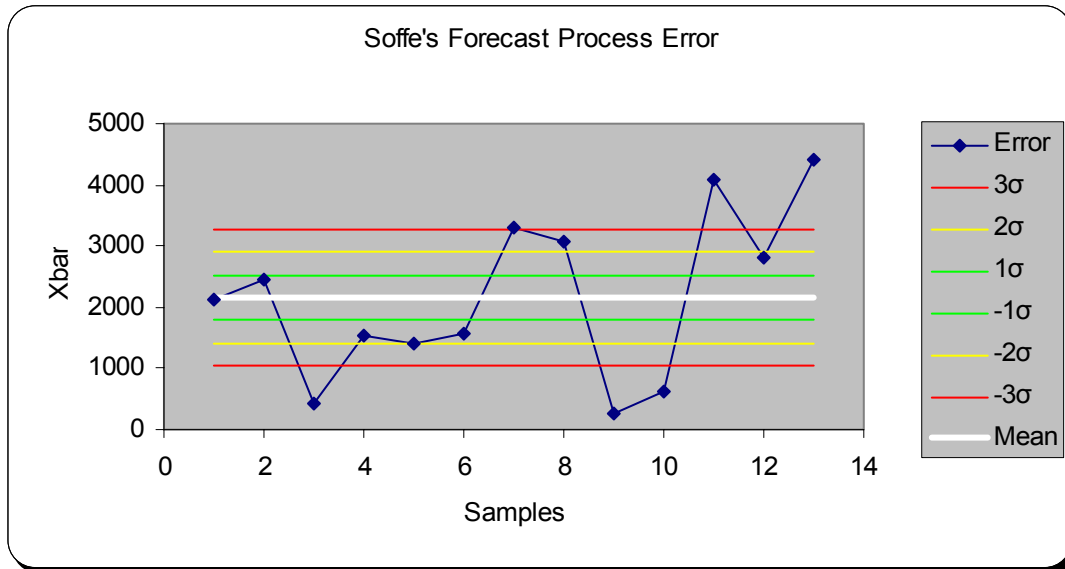


Figure 8. Soffe's Forecast Process Error

To eliminate the question of distortion caused by the large quantities forecasted in some months versus the smaller quantities in other months, the control chart analysis that was completed above was also performed with the percentage of Soffe's forecast errors compared to the actual demand (Figure 9). The percentage error analysis avoids confounding demand magnitude changes (with attendant changes in the magnitude of the forecast error) with changes in the relative accuracy of the forecast. In other words, the magnitude of an error may increase in part because demand itself has increased, not because the forecast is relatively less accurate. Percentage-based control charts are especially useful when demand is seasonal. The percentage-based analysis does not concern itself with the issue of negative or positive bias. A forecasting process based on the percentage of error to the actual demand is modeled in Figure 9. The analysis supports the claim that Soffe's forecasting process is uncontrolled.

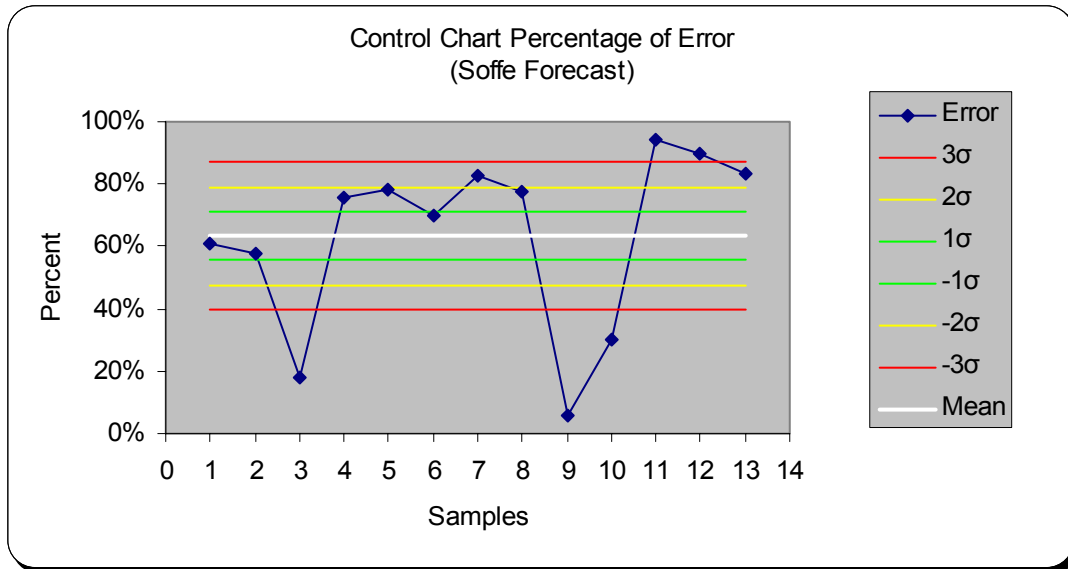


Figure 9. Soffe's Forecast Process by Error Percentage

Similar to Figure 8, Figure 9 is in agreement with detection rules #1, #2, and #3, and likewise provides an indication of a process shift. The test was used to dismiss the hypothesis that there is a discrepancy in the forecast error analysis because of the large quantity of sales. The ratios are used to consider the various levels of demand, and yet the results of both measurements (quantity and percentage) show similar results.

Without any subsequent adjustment to production quantities and assuming that M.J. Soffe's planning process is fixed to meet only the forecast demand, their current planning process could be a cause of inventory stock outs, delayed inventories, and lost sales.<sup>37</sup> In the next section, Soffe's sales history will be used to determine a safety stock level as a method to balance their holding costs with customer service levels, and to avoid unnecessary holding costs, while maintaining adequate service levels.

## E. SAMPLE FORECAST

In order to make a more accurate forecast of sales, Figure 10 shows a forecast comprised of the average of three prior sales periods. The forecast line shown in Figure 10 is a moving average where three prior periods are averaged to estimate the next sales period. The moving average is used to reduce the error between actual sales and

<sup>37</sup> Anupindi, Ravi, et al. *Managing Business Process Flows*. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.



forecasted sales from what was shown in Figure 7. Figure 10 shows a more stable forecast in the moving average analysis. It is also more accurate to the actual demand, which can be used to manage inventory and stabilize production.

Given a larger sample size of historical demand data, there exist forecasting techniques far more sophisticated than a 3-month moving average.<sup>38</sup> However, as is clear from Figure 10, even this straightforward method can provide an improvement over the current process used. The 3-month moving average that was used as an example does not account for seasonality due to the small sample size. Further improvements could be expected by using the Winters' Method for Seasonal Problems. This method would require a sample size of at least two seasons of data. The Winters' Method provides a more advanced technique of using triple exponential smoothing that Softe could implement to estimate their seasonal demand and has the distinct advantage of being easy to update as new data becomes available.<sup>39</sup>

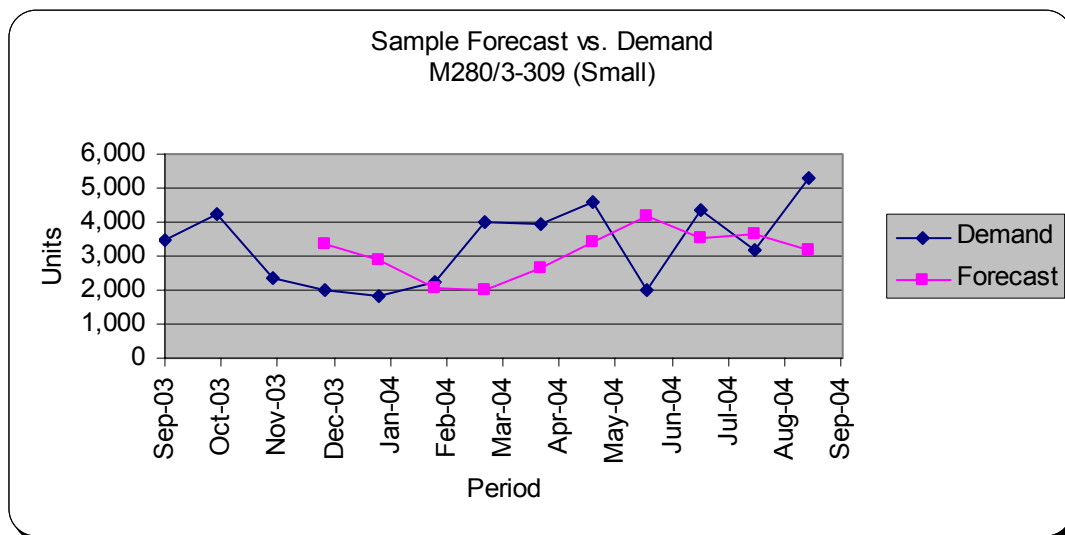


Figure 10. Actual Demand to Sample Moving Average Forecast (3-period)

The 3-month moving average forecast was performed on all sizes (small, medium, large, extra large, and double extra large) of one military production item extracted from

<sup>38</sup> Makridakis, S.G., et al. Forecasting: Methods and Applications. Wiley Publishing. Hoboken, New Jersey. 1997.

Soffe's inventory management system (MOVEX). The researchers chose one size (small) to focus on as an example to illustrate what results these methods can yield. Microsoft Excel<sup>®</sup> Macro functions and the raw data from MOVEX were used to perform analyses.

Table 4 illustrates the forecast error of the 3-month moving average forecast. As compared to Table 2, the 3-month moving average method of forecasting made a difference of 57%, which is an 88% improvement over Soffe's current forecasting method.

Period	Demand	Forecast	Error	Amount of Error Percentage
Sep-03	3,485	0	0	0
Oct-03	4,244	0	0	0
Nov-03	2,352	0	0	0
Dec-03	2,005	3,360	-1,355	-67.58%
Jan-04	1,796	2,867	-1,071	-59.63%
Feb-04	2,222	2,051	171	7.70%
Mar-04	3,983	2,008	1,975	49.59%
Apr-04	3,951	2,667	1,284	32.50%
May-04	4,607	3,385	1,222	26.52%
Jun-04	2,029	4,186	-2,157	-106.31%
Jul-04	4,332	3,529	803	18.54%
Aug-04	3,149	3,656	-507	-16.10%
Sep-04	5,300	3,170	2,130	40.19%
<b>TOTAL</b>	<b>33,374</b>	<b>30,879</b>	<b>2,495</b>	<b>7.48%</b>

Table 4. Sample 3-Month Moving Average Forecast Error to Demand

An MFE analysis was performed on the sample forecast as well. The sample MFE analysis in Table 5 shows a decrease in the average error by 1,907. This is an improvement of 88% over Soffe's current method. The analysis done in Table 5 reiterates the results found in Table 4. Also, the MAD in Table 5 indicates that the sample forecast has less deviation in the forecast error than what was found in Soffe's current forecast.

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<sup>39</sup> Nahmias, Steven. Production and Operations Analysis. 3<sup>rd</sup> ed. McGraw-Hill/Irwin. Boston Massachusetts. 1997.

Period	Demand	Forecast	Error	Absolute Error
Sep-03	3,485	0	0	0
Oct-03	4,244	0	0	0
Nov-03	2,352	0	0	0
Dec-03	2,005	3,360	-1,355	1355
Jan-04	1,796	2,867	-1,071	1071
Feb-04	2,222	2,051	171	171
Mar-04	3,983	2,008	1,975	1975
Apr-04	3,951	2,667	1,284	1284
May-04	4,607	3,385	1,222	1222
Jun-04	2,029	4,186	-2,157	2157
Jul-04	4,332	3,529	803	803
Aug-04	3,149	3,656	-507	507
Sep-04	5,300	3,170	2,130	2130
<b>MFE</b>				<b>249.50</b>
<b>MAD</b>				<b>1267.50</b>

Table 5. Sample Error Analysis M280/3 309

Planners should consider using systematic methods to control production and inventory levels for safety stock and warehousing management. As illustrated above, even implementing a primitive systematic forecast process will contribute to increasing Soffe's forecast accuracy.

## F. SAFETY STOCK AND INVENTORY

Companies employ many inventory methods to mitigate supply and demand imbalances. Safety stock is a strategy used to manage these fluctuations. "Safety stock is needed for those occasions when actual usage exceeds forecasted demand."<sup>40</sup> Demand uncertainties can cause inventory stock-outs which result in the inability to fill orders. To maintain high customer service levels while keeping minimal safety stock, managers need to determine inventory levels that balance their holding costs to the benefits of carrying the inventory.<sup>41</sup>

<sup>40</sup> Schreibfeder, Jon. "A New Look at Safety Stock." Effective Inventory Management, Inc. [www.effectiveinventory.com](http://www.effectiveinventory.com). Retrieved on 6 December 2004.

<sup>41</sup> Anupindi, Ravi, et al. *Managing Business Process Flows*. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.

The following analysis will calculate reorder points (ROP) which will then be used to determine an optimal level of safety stock. In developing the ROP, the researchers will refer to Soffe's inventory position. The inventory position is equal to the on hand inventory, plus any inventory already on order from production. The ROP will be stated in terms of an inventory position. When the inventory position falls to the ROP, it is an indication to Soffe that they should place a new production order. Given Soffe's long production lead times, it is to be expected that at least one production batch is on order, most of the time. The researchers will assume that Soffe has a continuous review of their inventory position and can release a production order at any time if the inventory position falls to the stated level. If instead Soffe follows a periodic review policy, placing orders only at set times when, for example, their MRP system is run, then the ROP (and hence safety stock levels) the researchers recommend would need to be adjusted.

Finally, the only source of variability the researchers will examine is demand variability. The variability in production lead time and forecast error will be ignored. The lead time in production will be ignored because Soffe was unable to provide information on it. The forecast error variability was ignored because it was not clear how Soffe incorporates the forecast into their production quantities. The implication of the applied treatment of demand as a sole source of variability is that the ROP and safety stock described in this section might not obtain the desired service level. For the development of an inventory model that could be used with a periodic review of inventory and that incorporates lead time variability and forecast error, the reader is referred to Nahmias<sup>42</sup>.

Soffe experiences periods where they either maintain too much inventory or do not have enough to fill their customers' demand. Figure 11 illustrates the months where Soffe's demand exceeded their in-stock inventory. When customer demand was high, inventory levels dropped significantly. Soffe manufactures products based on their forecasts which are later modified by their reaction to the current demand. Figure 11

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<sup>42</sup> Nahmias, Steven. *Production and Operations Analysis*. 3<sup>rd</sup> ed. McGraw-Hill/Irwin. Boston Massachusetts. 1997.

illustrates that the rise in inventory is a reaction to their demand being greater than forecasted. This reaction is also known as the “bullwhip” effect. Their reaction is consistent with the bullwhip effect and is caused by demand signal processing and shortage gaming.<sup>43</sup> This philosophy is a reaction to holding excessive inventory during times of low demand.

Demand signal processing is when the “demand during the current period is higher than forecasted.” The forecast of future demand is then adjusted upward by the producer to counteract a believed surge in demand. The bullwhip effect causes the estimate of forecast error to increase as well as the need for a larger safety stock to compensate for the increased error in the forecast.<sup>44</sup> It also increases the variability which is exacerbated by the delay in material and information flow between the supplier and retailer.<sup>45</sup>

The main causes of Soffe’s bullwhip are inefficient processes (e.g. erroneous demand forecasting) and inconsistency of available information (e.g. inaccurate data caused by a small sample of historical demand).<sup>46</sup>

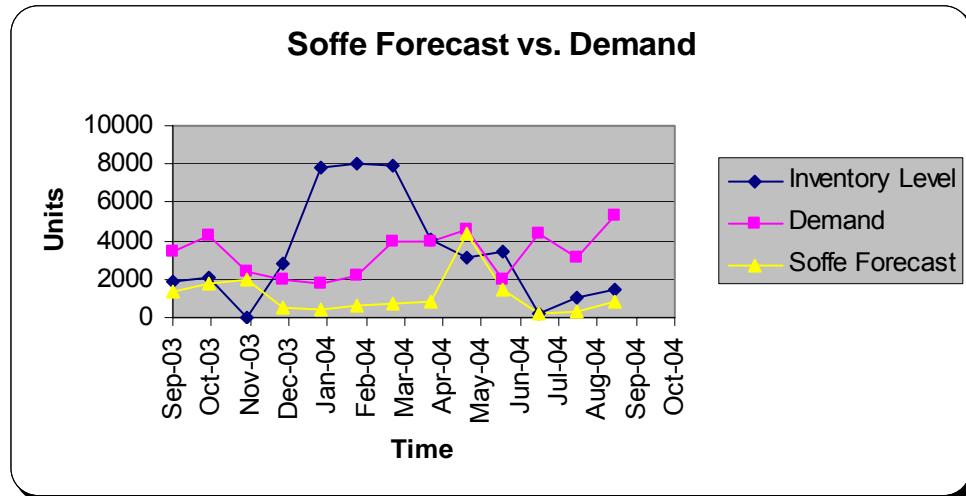


Figure 11. Soffe Inventory versus Demand

<sup>43</sup> Anupindi, Ravi, et al. *Managing Business Process Flows*. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.

<sup>44</sup> Ibid.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid.

As noted during the plant tour, Soffe's managers are not satisfied with their current inventory management methodology. Although they are aware of the discrepancies between inventory levels and demand, the managers do not know the magnitude of the impact of these discrepancies on holding costs. Implementing a safety stock program is a way to stabilize Soffe's holding costs while increasing their customer service levels. Average forecasted sales combined with production lead time will be used in the ROP analysis to help stabilize Soffe's production. The lead time is an estimate provided by Soffe's managers and is based on the lead times from the last several stock periods.

Figure 12 shows the relationship between Soffe's average lead time and their average forecasted sales. The figure illustrates a reorder point to be used in determining an optimal level of safety stock, for the small M280 undershirt.  $L$  is the average lead time and  $R$  is the average demand rate.

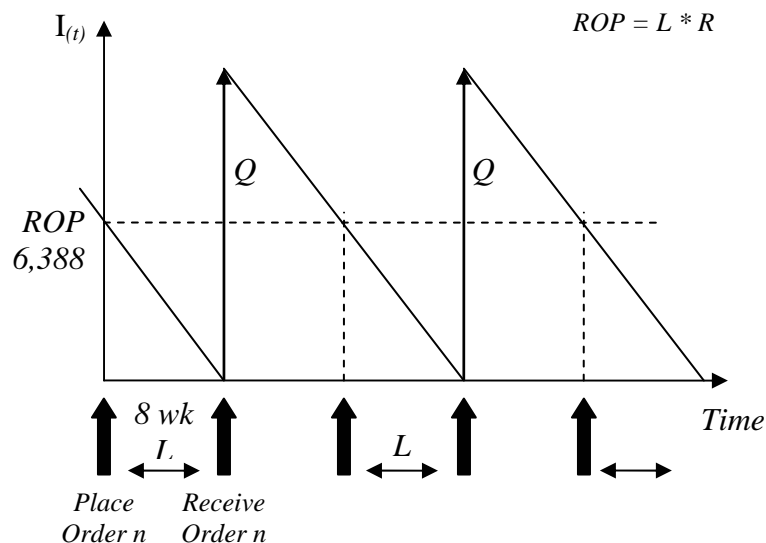


Figure 12. Reorder Point<sup>47</sup>

Assuming for a moment that both demand and lead time are constant, we can calculate:

<sup>47</sup> Anupindi, Ravi, et al. Managing Business Process Flows. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.

$$ROP = L * R_{(d)}$$

L = production lead time = 2 months (8 weeks)

$R_{(d)}$  = Mean Forecasted Demand Rate for Size Small M280 = 3,194/month

(Where 3,194 is the mean of the 11 month forecast given by the 3-month moving average.)

$$\Rightarrow ROP = 2 * 3,194 = 6,388 \text{ (assuming no variability in demand).}$$

The above analysis does not account for demand variability. The follow on analyses will take this into account. In order to determine Soffe's ability to meet demand and their need more safety stock, the amount of the shortage was also measured. According to the data gathered during the site visit for this 13 month period, there were seven months that Soffe was unable to meet customer demand of the small M280 undershirt. Figure 11 shows that there were seven stock outs out of thirteen periods (54% of the time). By using the formula below, Soffe's fill rate is calculated to be 40.55%. This fill rate means that 59.45% of customers who wanted to purchase shirts from Soffe could not get them, and either purchased them somewhere else or had to back-ordered them. This shortage is a representation of Soffe's inability to meet their demand from their current inventory and will continue if they don't adjust their forecast levels upward to meet demand.

Fill Rate is calculated as:  $\sum(D - I)^+ / \sum D$

where D represents demand

and I represents inventory.

Service levels are a representation of how much demand can be satisfied with the inventory on hand.<sup>48</sup> Soffe's service level for their small M280 is 35%, as illustrated in Figure 11. This indicates that Soffe's inventory levels are extremely low compared to their demand for these periods. Safety stock will increase their fill rate by reducing stock outs.

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<sup>48</sup> Anupindi, Ravi, et al. Managing Business Process Flows. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.

Safety stock is used to prevent stock outs while maintaining the most economical level of inventory, as shown in Figure 13. “The ROP is used to meet the flow-unit requirements until the new order is received  $L$  periods later. The risk of stock out occurs during this period of replenishment lead time.”<sup>49</sup> If demand during lead time exceeds the safety level, a stock out will occur. The average lead time demand is denoted by  $\mu$ .

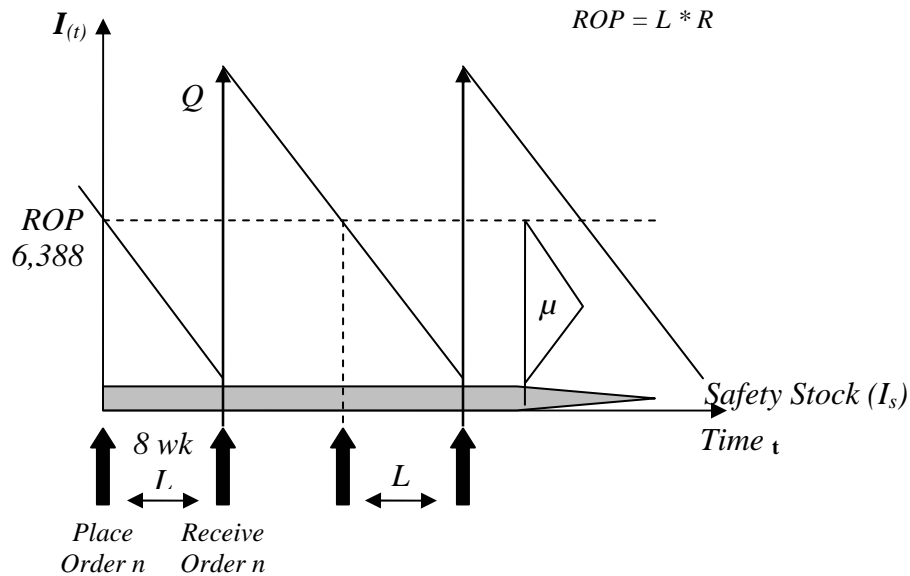


Figure 13. Safety Stock

To explain Figure 13, assume that the reorder point is also equal to  $\mu$ . If just enough inventory is held to satisfy the forecasted demand, anytime that demand is greater than forecasted demand, they will stock out. The variability is what causes stock-outs unless there is a safety stock. To account for lead time demand variability, orders need to occur earlier. This can be accomplished by making the reorder point greater than the average lead time demand of  $\mu$ . The added amount is the safety stock that is carried over the average demand. With this consideration of variability, the ROP is expressed as:

$$ROP = \mu + I_s$$

Given the 35% service level for Soffe’s small M280 undershirts, it is valuable to determine a level of safety stock that will improve their capability to fill orders. The next

<sup>49</sup> Anupindi, Ravi, et al. Managing Business Process Flows. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.



calculation will determine an adequate safety stock by accounting for demand, estimated lead time and a desired service level.

$$I_s = \text{Safety\_Stock} = z\sigma_d\sqrt{L}$$

where  $z$  represents the desired service level

$\sigma_d$  represents the standard deviation of actual demand

$L$  represents the order lead time.

The actual average demand ( $\mu$ ) for these undershirts is 3,342 units/month over the 13 month test period with a standard deviation ( $\sigma$ ) of 1,162/ month. This calculation will also use a service level which is defined as “the probability that there will be no stock out within an order cycle or equivalently, the proportion of order cycles without a stock out, where order cycle is the time between two consecutive replenishment orders.”<sup>50</sup> The next calculation will combine the safety stock with the forecasted ROP to determine their optimal inventory holding requirements. Service levels are directly related to fill rates: as service levels increase, fill rates will also increase. But the exact relationship is complex, and beyond the scope of this report. The analysis will begin with a service level of 85% to determine the corresponding statistical  $z$  value.<sup>51</sup> Demand lead time is estimated by Soffe’s managers to be eight weeks (2 months).

Using a standard normal  $z$ -table, the value for  $z$  at 85% is 1.04. Therefore, safety stock ( $I_s$ ) is calculated by:

$$I_s = z\sigma_d\sqrt{L}$$

$$1.04 * 1,162 * \sqrt{2}$$

$$I_s = 1,709$$

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<sup>50</sup> Anupindi, Ravi, et al. Managing Business Process Flows. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.

<sup>51</sup> Ibid.

With a safety stock level of 1,709 and an average monthly demand of 3,343 the reorder point is:

$$ROP = R * L + I_s$$

$$ROP = 6,685 + 1,709 = 8,394$$

The safety stock was determined using actual demand rates. This was done to produce a more accurate estimate based on real data. Once the safety stock was calculated, the ROP was determined by adding the safety stock to the forecasted average demand. This formula proposes a systematic way to consider future sales combined with realistic safety stock. Again, note that the ROP is stated in terms of inventory position, not on-hand inventory. If, for example, Soffe produces on average a batch of 3,343 each time they set up for production, they will clearly need to produce at least once a month and with a product lead time of two months, it would not be surprising to find 6,600 of the ROP quantity in “on order” inventory and not in “on hand” inventory.

These analyses demonstrated that increased service levels have a direct relationship to the amount of safety stock, and consequently, inventory holding costs. Figure 14 illustrates this finding. Managers can use these models to increase customer service levels while holding a minimal level of inventory.<sup>52</sup>

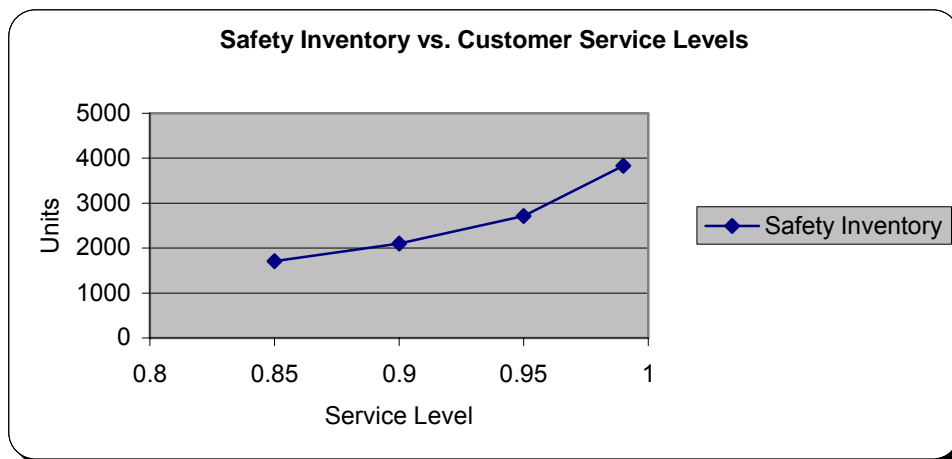


Figure 14. Safety Inventory versus Service Levels

<sup>52</sup> Anupindi, Ravi, et al. Managing Business Process Flows. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.

Since holding costs vary in direct proportion to the number of items in safety stock, Table 6 illustrates the percentage increase in holding costs incurred to achieve the various percentage increases in service levels (column A and B). For every percentage increase in service level, there is an exponential increase in holding costs (column B and C). Furthermore, there is diminishing marginal returns for increasing service levels to the costs of holding safety stock (column D and B).

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Safety Stock	Safety Stock % Increase	Service Level	Service Level % Increase
1,709	-	85%	-
2,103	18.75%	90%	5.56%
2,711	22.42%	95%	5.26%
3,829	29.18%	99%	4.04%

Table 6. Holding Costs as Compared to Service Levels

“The optimal service level should balance the benefits of improved service in terms of supply continuity and customer satisfaction with the additional costs of holding required safety inventory.”<sup>53</sup> The analysis considers sales forecasting, service levels, lead time, and demand.

## G. FINDINGS AND RECOMMENDATIONS FROM OPERATIONS

The findings from the analysis performed in this section provided opportunities for M.J. Soffe to review their current practices. The research found three areas that should be considered by Soffe’s managers:

- Their current forecasting system is uncontrolled,
- Their fill rates exhibit low customer service, and
- Their safety stock is not proportionate to their demand.

Uncontrolled forecast processes contribute to errors in planning. The high variability of forecast error makes manufacturing unstable and contributes to Soffe’s inventory problems identified in this research. It is recommended that Soffe focus first

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<sup>53</sup> Anupindi, Ravi, et al. Managing Business Process Flows. Kellogg Graduate School of Management. Northwestern University. Prentice Hall, New Jersey. 1999.

on correcting their demand forecasting process. Demand forecasting should consider factors such as sales history, common data (such as a single enterprise resource management system), and utilize a standard methodology. Soffe should consider performing a cost benefit analysis to determine if the costs of the error justifies hiring a forecast analyst. The forecast analyst will provide for an expert, unbiased opinion that will feed data into the planning department. More accurate forecasting can aid in determining levels of safety stock, to increase their fill rates, and reduce holding costs.

The analysis uncovered that Soffe has areas of low fill rates, which correlates to low service levels. Soffe can increase their customer service by developing a strategy for maintaining a level of safety stock that is proportional to their demand. This paper detailed only a basic analysis of safety stock. However, “in the age of fantastically cheap and abundant computing power it makes no sense to use simplistic rules to allocate safety stock. Safety stock represents a major investment for most manufacturing companies and companies should make sure that they are receiving the maximum benefit from their investment.<sup>54</sup>” It is recommended that Soffe acquire the resources to perform an adequate safety stock determination as an investment to eliminate inventory holding costs.

Additional consideration should be given to acknowledging that service levels are directly related to safety stock, and the level of safety stock contributes to inventory holding costs. This concept needs to be a general factor used in follow-on cost benefit analysis of holding inventory versus customer service levels.

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<sup>54</sup> Sandvig, J. “Simple Solutions Aren’t the Best Ones.” IIE Solutions. December 1998.

## **V. SUMMARY FINDINGS AND RECOMMENDATIONS**

### **A. INTRODUCTION**

To be a progressive firm within the apparel industry Soffe needs to adjust to the growth of their company and be proactive within the environment they operate.

The following list highlights the overall findings and recommendations located in this report.

### **B. SUMMARY FINDING 1: EXCLUSION FROM FEDERAL CONTRACTS**

Soffe is being excluded from competing for certain federal contracts based on solely on the size of their company.

- **Recommendation #1:** Develop an overarching strategy to all the divisions within Soffe are combining their efforts and resources towards common objectives.
- **Recommendation #2:** Leverage their compliance with the Berry Amendment to boast their prominent history of 100% American made products.
- **Recommendation #3:** Take a proactive role in the government requirements generation process by asserting themselves and their products to affect policy and shape the requirements of military goods.
- **Recommendation #4:** Create a marketing department to alleviate the collateral duties of their military sales managers.
- **Recommendation #5:** Allow the military sales department to create their own business entity to take advantage of the changes in federal procurement policy.

### **C. SUMMARY FINDING 2: SOFFE FORECASTING PROCESS IS VARIABLE**

Soffe's current sales forecasting process is highly variable and uncontrolled.

- **Recommendation #6:** Correct Soffe's demand forecasting process by employing a standard methodology and consider investing in a dedicated forecast analyst.

### **D. SUMMARY FINDING 3: CURRENT SAFETY STOCK NOT ADEQUATE**

Safety stock not proportionate to demand and causes elevated holding costs during periods of low sales, and exhibits low service rates during periods of high sales.

- **Recommendation #7:** Adopt a methodology to perform quantitative analysis of forecasting and inventory. It is also recommended that Soffe acquire the resources to perform an adequate safety stock determination as an investment to eliminate inventory holding costs.

#### **E. OPPORTUNITIES FOR FURTHER STUDY**

There are many areas open for further research. M.J. Soffe has implemented plans in the last quarter to more accurately track inventory and production costs and some data was not available to further this analysis. A follow-on study could be started in FY06. At this time at least 18 months of data will be available from Soffe's initiatives today. Some of the areas suggested are:

- Incorporate a single inventory management system to track products from manufacturing to distribution. Consider incorporating a tracking mechanism for raw materials (e.g. grieg goods). Investigate the possible mismatch of PKMS and MOVEX.
- Estimation of inventory holding costs to help managers more accurately forecast holding inventory and economic order quantities. This way they can factor in the costs associated with carrying excess inventory as opposed to the opportunity costs of forgone sales.
- Market research into whether or not revenues support the separation of the military sales department.
- Form a study group to eliminate the need for rush orders.
- Manufacturing cycle-time reduction. Analyze the manufacturing process to compare the inefficiencies of batch processes to flow processing.

Investigate the benefits of moving the contracting function up to the strategic level of management within the company. What happens if Soffe moves the "clerical mindset" of contracting up to the level of managerial strategy?

#### **F. CONCLUSIONS**

M.J. Soffe's goal is to better serve the Department of Defense by initiating practices that provide the best products while complimenting government acquisition initiatives. Soffe's proactive management has fully supported opening their doors to let us evaluate and learn about the apparel industry in an effort to identify cost savings on future contracts. Soffe's aim is to improve their business relationships by reducing customer lead time, provide a high quality products and services, while maintaining competitive prices. Soffe can take control of the environment in which they do business

by proactively keeping themselves open to progressive ideas. This project can be used by the Soffe Company to further enhance their military sales, sales forecasting, and inventory control.

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